HECKSCHER-OHLIN MODEL CONTINUED – EMPIRICAL EVIDENCE

FACTOR CONTENT OF TRADE

General idea: by trading goods, countries are indirectly trading the factors
that are contained in the production of those goods

If relatively capital-abundant countries export relatively capital-intensive goods,
their exports should contain relatively more capital than their imports
This is also the intuition behind factor price equalization (FPE) in the 2-by-2 model

(More generally, if the number of factors F exceeds the number of goods G,
then zero-profit-conditions give G equations for F unknowns; can't solve.
Factor prices will then depend on factor endowments
Trade may reduce factor prices difference across countries, but not full FPE.)

Need to include direct and indirect factor content (factor content of material inputs)
Can calculate all this using input-output matrix.

Tested for US by Leontief (1953) and Baldwin (1971). Result (from K-O):

TABLE 4-2 Factor Content of U.S. Exports and Imports for 1962

	Imports	Exports
Capital per million dollars	$2,132,000	$1,876,000
Labor (person-years) per million dollars	119	131
Capital-labor ratio (dollars per worker)	$17,916	$14,321
Average years of education per worker	9.9	10.1
Proportion of engineers and scientists in work force	0.0189	0.0255

Source: Robert Baldwin, "Determinants of the Commodity Structure of U.S. Trade," *American Economic Review* 61 (March 1971), pp. 126–145.

K/L higher in imports, but US was much more capital abundant than ROW in 1962
This is the Leontief Paradox.
But US exports have larger high-skill / total labor ratio; this is as expected.

Also, the Leontief paradox has disappeared after 1970s.
Perhaps because capital differences have also narrowed,
and in some cases even reversed (Japan has high capital endowment etc)

Generalization to many factors (Bowen, Leamer, Sveikauskas AER 1987)
For any factor (say labor) and any country (say US):

If Content of labor in US production > content of labor in US consumption,
then US is (indirectly) exporting labor through the labor content of its trade

Recognize that Content of labor in US production = US labor endowment

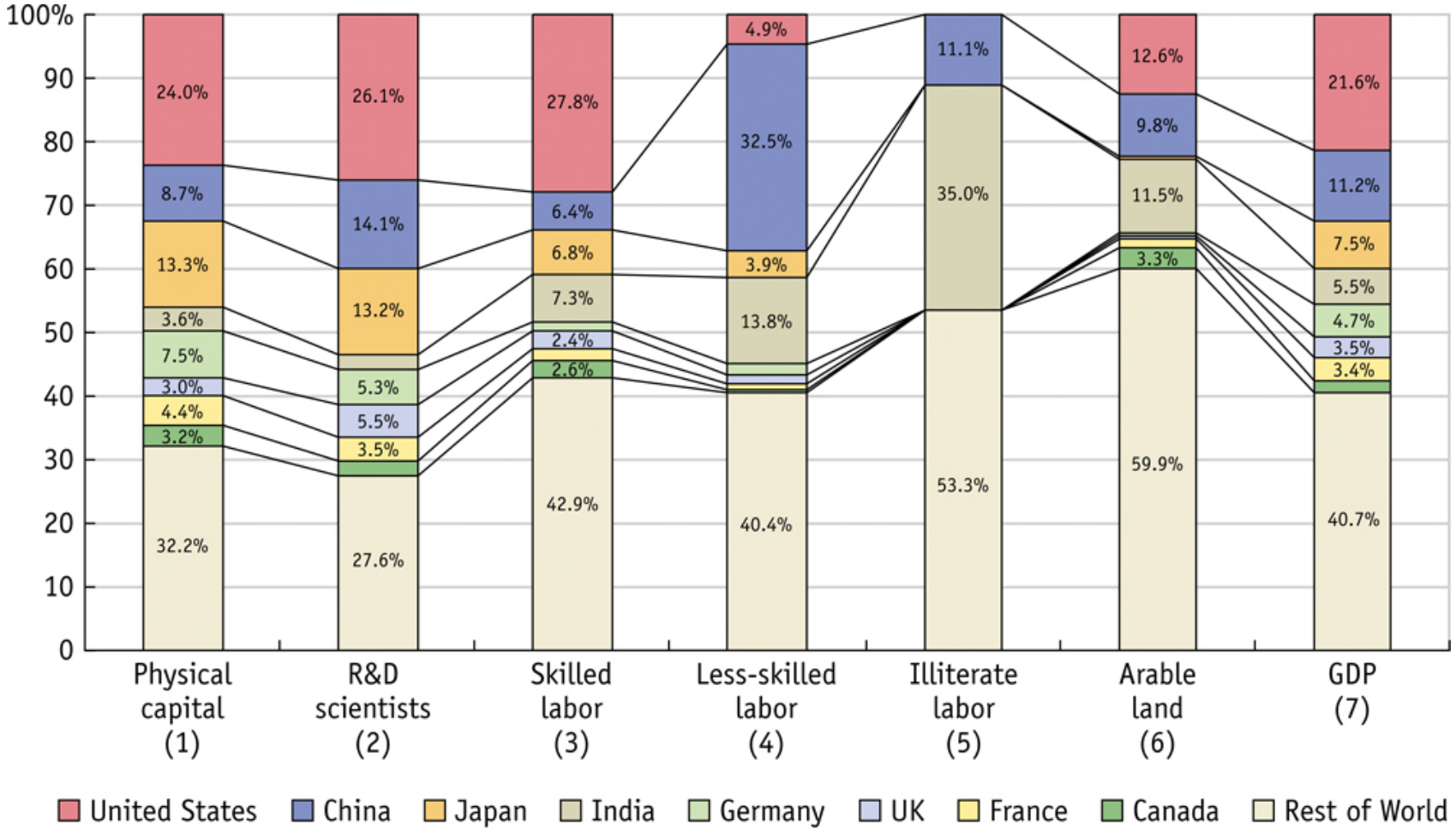
Divide both sides by Content of labor in world production
= Content of labor in world consumption = World labor endowment

So condition for US to be exporting labor through goods trade is

US labor endowment / World labor endowment >
Content of labor in US consumption / Content of labor in world consumption
which is = US income / World income if preferences identical, homothetic.

Calculate factor content of US net exports using input-output methods, and
test whether it conforms to this simple inequality
In practice, need to correct this for saving, so US consumption > US income etc.
Also homotheticity in consumption may not be valid

Evidence on factor abundance (for each factor, its %s among countries)



So US and Japan should be large net exporters of highest-skill labor,
China of less-skilled labor, India and ROW of least-skill labor, etc.

Bowen et al test their prediction for every country-factor pair.
Their success rate (table from K-O):

TABLE 4-3 Testing the Heckscher-Ohlin Model

Factor of Production	Predictive Success*
Capital	0.52
Labor	0.67
Professional workers	0.78
Managerial workers	0.22
Clerical workers	0.59
Sales workers	0.67
Service workers	0.67
Agricultural workers	0.63
Production workers	0.70
Arable land	0.70
Pasture land	0.52
Forest	0.70

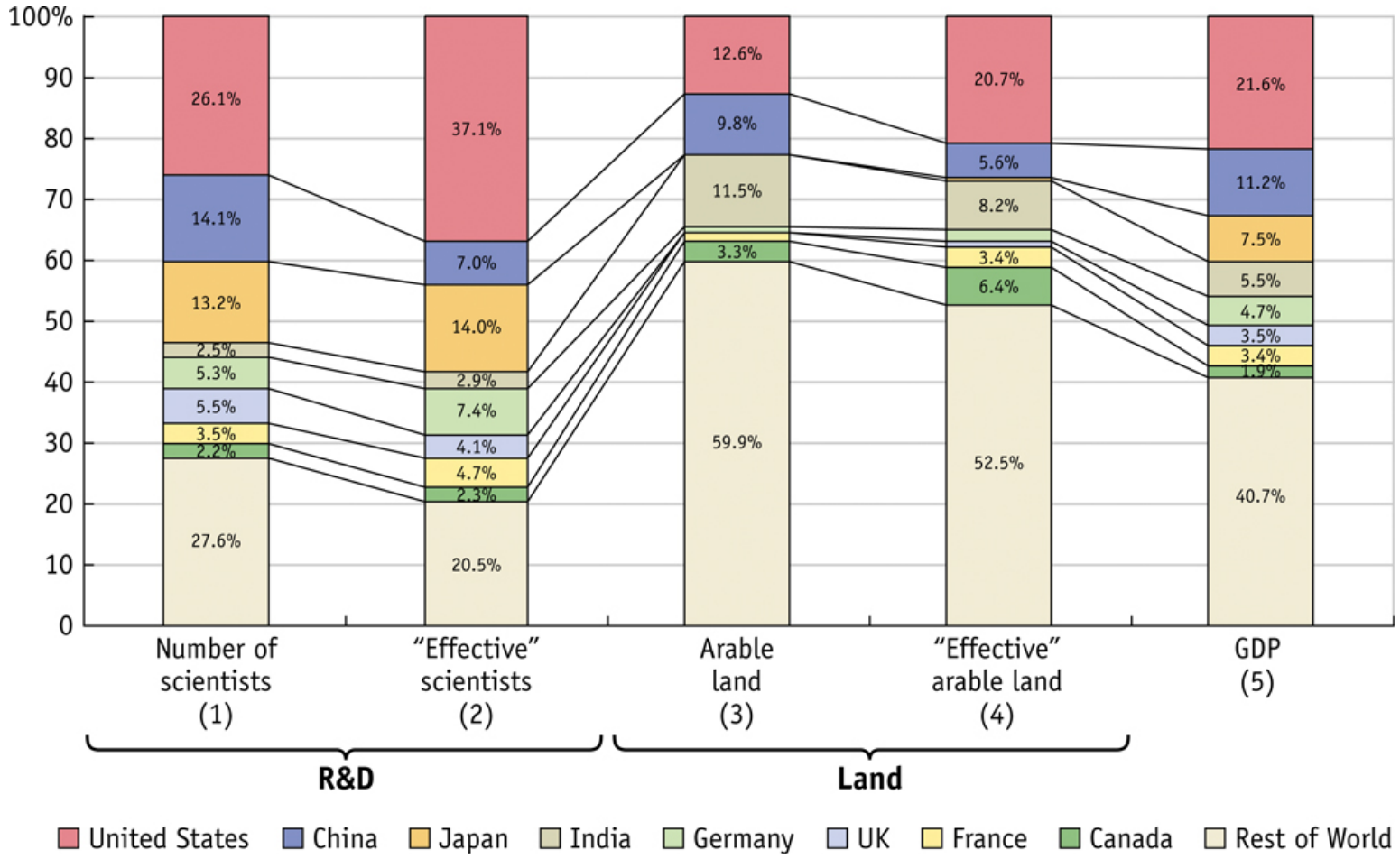
*Fraction of countries for which net exports of factor runs in predicted direction.

Source: Harry P. Bowen, Edward E. Leamer, and Leo Sveikauskas, "Multicountry, Multifactor Tests of the Factor Abundance Theory," *American Economic Review* 77 (December 1987), pp. 791–809.

Mixed result. But remember: H-O is never intended as a complete explanation of all of trade. Applications must combine it with other theories.

OTHER EXPLANATIONS: TECHNOLOGY DIFFERENCES

These are massive across countries, both for overall productive efficiency, and for efficiency of particular factors. Evidence for skill, land:



NORTH-SOUTH TRADE

Examples: [1] China's trade with the 3 biggest economies

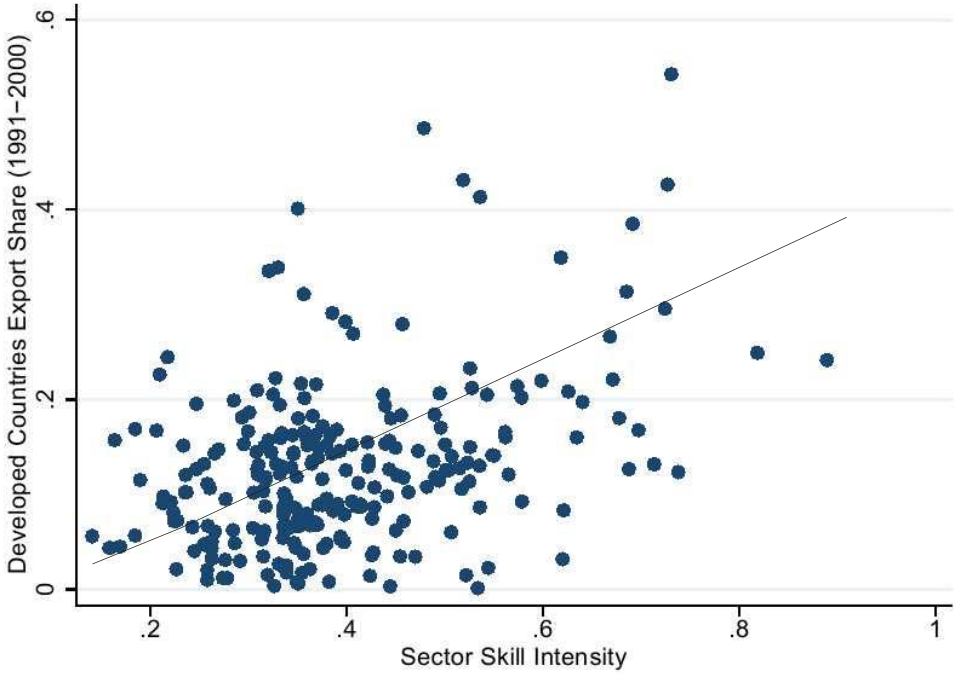
TABLE 4-4 Trade Between China and Big 3 Advanced Economies, 2003 (billion dollars)

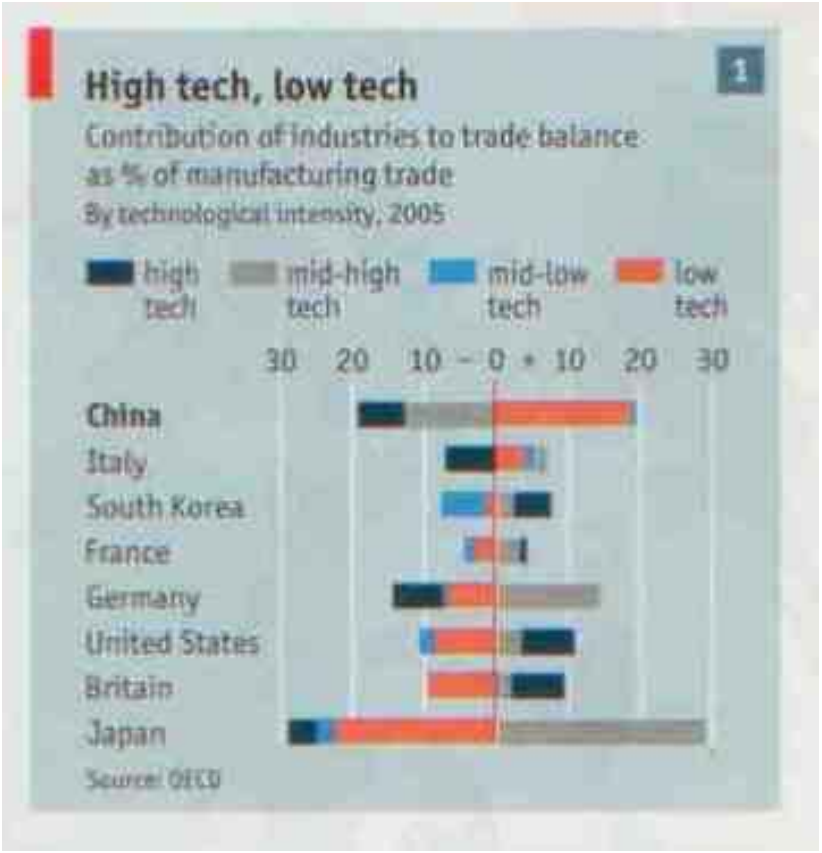
Type of Product	Chinese Exports to Big 3	Chinese Imports from Big 3
Chemicals	8.57	20.08
Nonelectrical machinery	9.00	31.81
Clothing	25.36	0.32
Other consumer goods	46.80	14.58

Source: World Trade Organization.

H-O explains direction of N-S trade well, but badly under-explains its volume
    Trefler's "The Case of the Missing Trade"
Must combine it with technical efficiency differences between N and S
North's endowment of "efficiency units of labor" is much larger than "physical units"
    so N-S endowment differences smaller when so corrected

[2] Skill intensity and trade: Across goods and across countries.

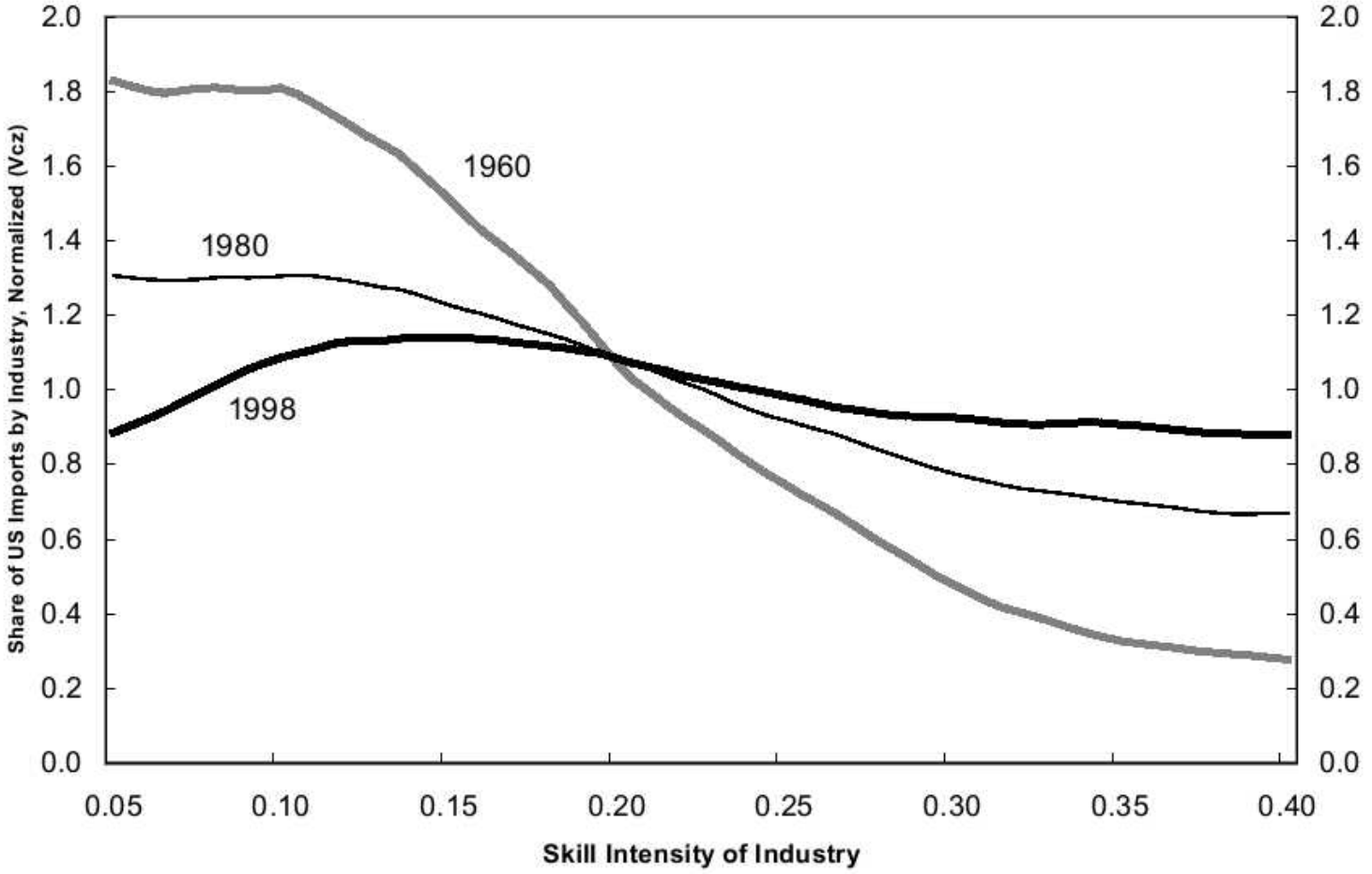




From *The Economist,* 2/21/09

[3] Change in pattern of trade as a country acquires more capital and skill
Consequence of Rybczynski effect on supply (Romalis AEA 2004):

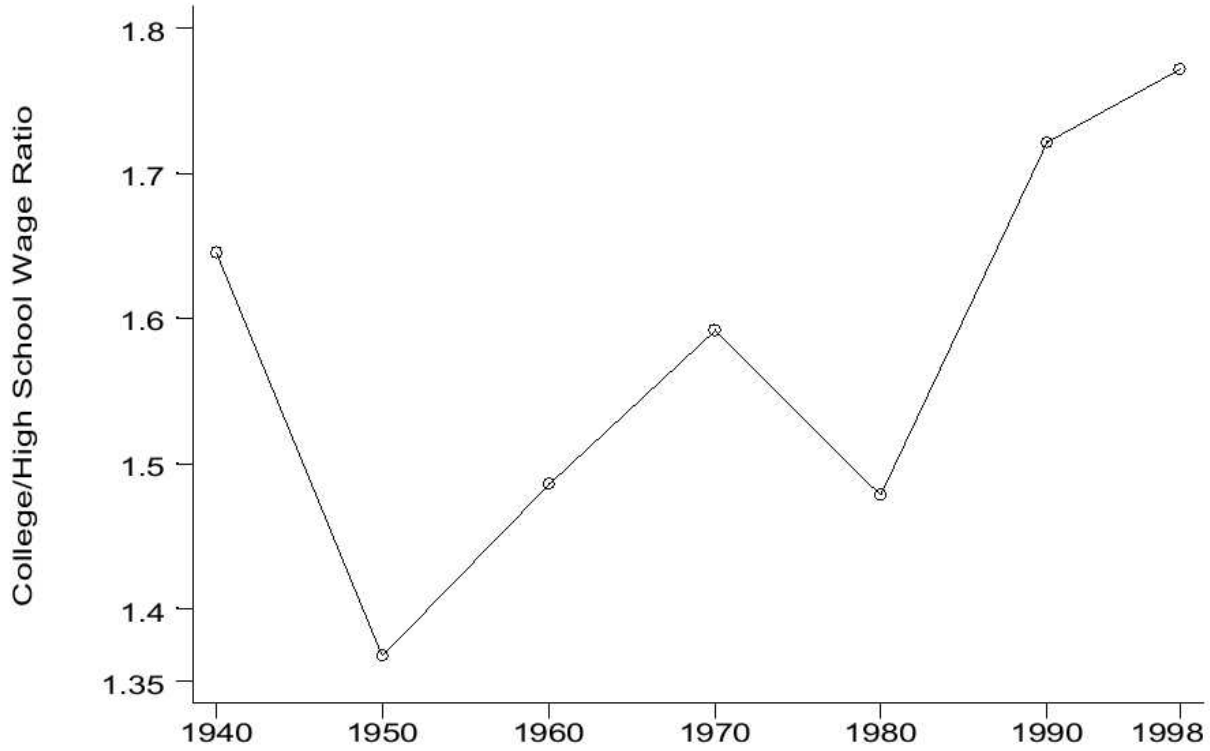
Figure 2: Rybczynski Effect for the Asian Miracle Economies*
Combined US Import Shares 1960-1998
(*Singapore, Hong Kong, Taiwan, Korea)



TRADE AND WAGES

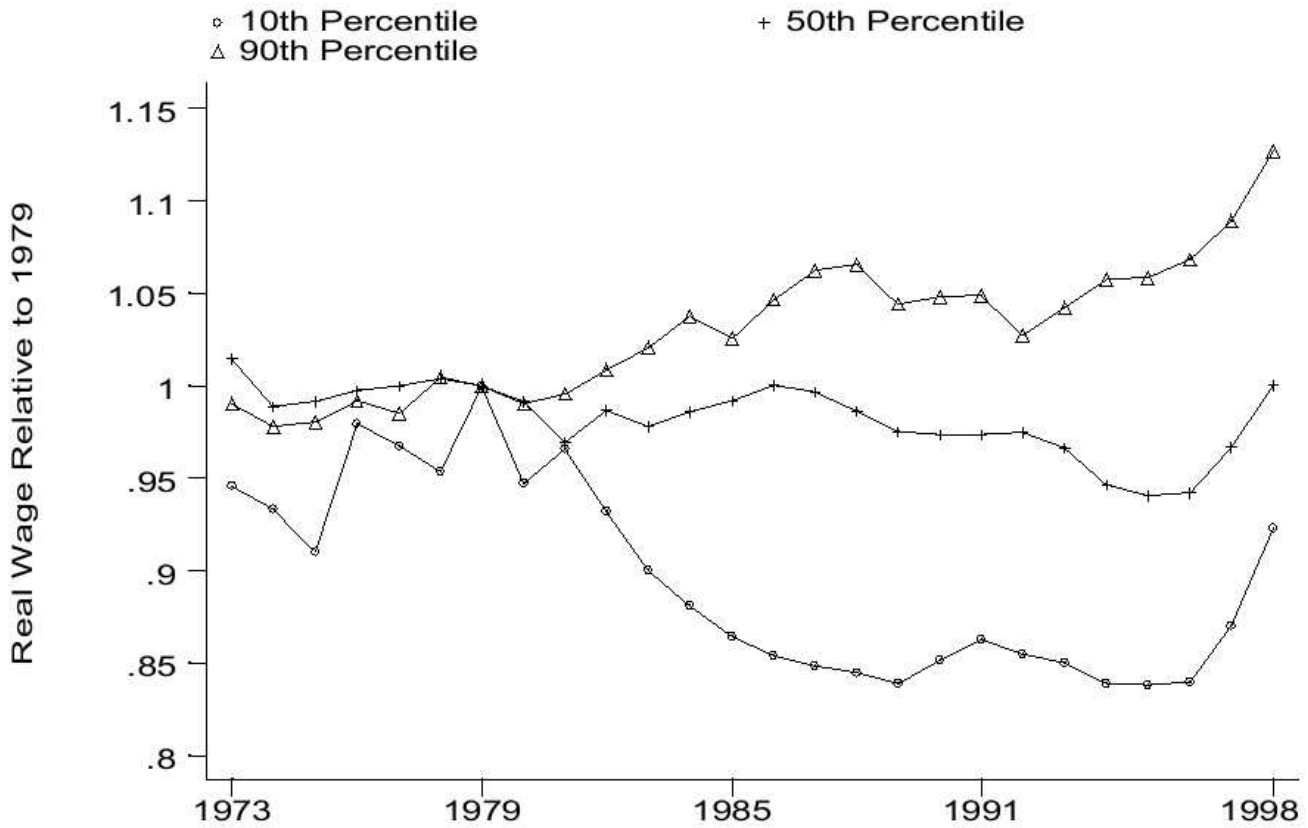
Wage inequality has risen in the US during recent decades:
higher premium to education / skills

Figure 4: The College/High School Wage Ratio, 1940-98



By deciles of the wage distribution:

Figure 3: Indexed Real Hourly Wage by Percentile, 1973-98 (1979=1)



Has trade caused some or all of this rise in inequality?
Think of H-O model with two inputs, skilled labor and unskilled labor.
US is relatively skill-abundant, so it will
export skill-intensive goods, import unskilled-labor-intensive (ULI)
Trade will lower the relative price of the ULIs;
by Stolper-Samuelson it will lower unskilled wage
Empirical questions: How big is the change in relative prices?
How big is the effect on relative wages?

A conceptual framework: Write GDP = $F(P_X, P_Y, E_S, E_U)$ where

P_X, P_Y are output prices, and the function is homogeneous degree 1 in the two;

E_S, E_U are supplies of skilled, unskilled labor in "efficiency units",

$E_S = A_S \ L_S$, $E_U = A_U \ L_U$, where

L_S, L_U are physical units of labor and A_S, A_U technology shift parameters.

Then $W_S = A_S \ \partial F/\partial E_S$, $W_U = A_U \ \partial F/\partial E_U$
Taking ratios, and then logs of the ratios changes in these, and using homogeneity:

$$\Delta \ln(W_U/W_S) = \mu \Delta \ln(P_X/P_Y) + (1-\beta) \Delta \ln(A_U/A_S) - \beta \Delta \ln(L_U/L_S)$$

Interpretations:
μ is the Stolper-Samuelson effect, < 0 if US exports skill-intensive X
β = 1 / elasticity of substitution between skilled and unskilled labor
    If substitution is high (β low), large changes in supply have small wage effects
Technical progress can affect wages either way:
    It raises total product of a given quantity of that factor,
      but by increasing supply in efficiency units, can lower the marginal product

Should complicate this: multiple labor types, other factors, non-traded goods, ...

Makes it difficult to isolate effect of trade on wage inequality
      and compare it with effects of other contributing explanations:
      [1] Bias of technical progress – fall in demand for unskilled labor.
      [2] Changes in US tax and other fiscal policies.

Research has yielded mixed results is not conclusive.

But reasons to be skeptical about magnitude of role of trade.

[1] There is no clear evidence of substantial change in relative prices of goods
US TOT almost unchanged (Table from K-O)

TABLE 5-1 Average Annual Percent Changes in Terms of Trade

	1986–1995	1996–2005
Advanced economies	0.8	−0.1
Developing Asia	−0.4	−1.1

[2] The same mechanism predicts a fall in skilled-unskilled inequality in LDCs:
this has not happened in any systematic way.
[3] US imports from LDCs increased sharply in the 1970s, but
inequality was low and skill premium fell in the 1970s.
[4] Little change in share of capital in US GDP;

why would trade change (W_U/W_S) but not W/R?

Will also look at effect of immigration on wages later.